

Why the inclusion of women's perception in plant breeding programs is critical: an example from India

Introduction

The traditional plant breeding programs of the 20th century focused on improving crop traits to achieve a higher productivity. Aspects of adoption of these improved varieties by farmers and consumers were for the most part overlooked when considering the breeding objectives.¹ The lack of inclusion of the demographic, economic and social conditions of end-users led in many cases to low-adoption rates of improved varieties. Moreover, the inclusion of women's trait preferences has only recently become part of a broader discussion in plant breeding programs. Sumberg et al.² suggest that breeding programs should be more customer-driven and this requires a marketing approach. The end-consumer should also be considered as a beneficiary, not only the farmers. The traits farmers and consumers preferences are not always the same and for plant breeding programs to be successful, farmers, processors and consumers, particularly women, should be equally considered as beneficiaries. As pointed out by Tekeen et al.³ addressing gender can help set breeding priorities and expand the potential impact of improved varieties.

Pulses are an important part of the diet in India. Most households in India rely on pulses such as pigeon pea (*Cajanus cajan* L.) as one of the main sources of dietary protein. Thus, pigeon pea has become the second most important pulse crop and currently, there are over 3.5 M ha of the crop planted throughout northern and central India. Globally, India contributes to more than 85 per cent of the total production of pigeon pea. Stagnation in productivity because of inadequate availability of improved seeds, biotic and abiotic stresses, and poor pest management, has been a major concern. Because of the importance of this crop in the Indian diet, the Indo-Swiss Collaboration in Biotechnology (ISCB), which is a bilateral research and product development program, jointly funded and steered by the Indian and Swiss governments (Department of Biotechnology in New Delhi and Swiss Agency for Development & Cooperation) has worked on plant improvement for several decades. In the fourth phase of the program, farmers', processors' and consumers' preferences of improved traits were assessed.

With the overall goal to contribute towards food security in the Indian context and supporting sustainable and climate resilient agriculture, new and improved cultivars were developed as a result of the program. In the fourth phase of the program, the socio-economic conditions for the successful introduction of improved pigeon pea varieties were assessed. A socio-economic component was included in the ISCB pigeon pea network to analyse three major aspects of the pigeon pea production environment. First, changes in the traditional pigeon pea production areas were traced, identifying emerging production centres and yield gaps at the district level. Second, socio-economic constraints faced by farmers in pigeon pea production and traits preference of the stakeholders were identified, including end consumers. Finally, ex-ante evaluation of improved pigeon pea varieties was conducted. The goal was to understand not only the farmer's perception, but also the consumer preferences to provide the biotechnologists and plant breeders with information related to the

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Ingrid Fromm

School of Agricultural, Forest and Food Sciences, Bern University of Applied Sciences, Switzerland

Correspondence: Ingrid Fromm, School of Agricultural, Forest and Food Sciences, Bern University of Applied Sciences, Zollikofen, Switzerland, Email ingrid.fromm@bfh.ch

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main traits accepted by consumers, thereby linking scientists, farmers, support organizations and the end consumers.

While farmers reported that the most important traits for them were higher yields, early maturing, drought tolerance and resistance to pod borer resistant varieties, processors preferred uniform-size grains for a better milling process. Consumers were also interviewed in this study. Data on consumer perception and preferences was collected in two urban centers in two regions of India: Delhi for the north part and Hyderabad representing central India. Six hundred respondents were interviewed in different socio-economic levels: low-income, middle-income and high-income families. Over 80% of the respondents were women and even in the cases when men were interviewed, respondents informed that in 96% of the households, it's women who cook and take the decision of what to cook. Specifically, they were asked questions about the family consumption pattern, the decision-taking process and the criteria to select pigeon pea.

First and foremost, the results indicate that women are at the forefront of the decision-taking process when it comes to pigeon pea consumption. In 95% of the cases, women decided which pulses to eat, how often they eat them and how they are prepared. Even in the cases when men were interviewed, they reported that women in their households take these decisions. This study showed that over half of the families interviewed eat pigeon pea daily or at least several times a week. In 96% of the cases, it is consumed in the form of dal. It is also women who look for "favorable" or "unfavorable" characteristics in the grains when buying pigeon pea. Women assessed traits such as clean, uniform grains and rapid cooking time as more desirable. Organoleptic characteristics were of high importance to them. How clean the grain is and how it's presented was also high on their priority list. Price was another criterion that influenced if they consumed pigeon pea or not. Their awareness about other traits such as yields, drought tolerance, resistance to pests or other traits which have directly impacted pigeon pea productivity in India was minimal.

Plant breeding programs need to take an approach where households are also considered in the trait selection and breeding objectives. In

the past, the farmer has been a central figure in the objective-setting process, overlook at times what consumers, particularly women, desire in specific crop traits. Additionally, as Ragot et al.⁴ point out, breeding objectives and priorities are often set in relation to geography instead of demography, even in the case of breeding programs serving resource-poor farmers, traders, processors, and consumers. In the case of end-consumers, women play a central role in the decision-taking process of what to cook, how to cook it and how often to cook it, as it is evident in this example from pigeon pea consumption in India.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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